UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Ground Water Branch

PROPOSED WELL SITES AT WHISKEYTOWN RESERVOIR, SHASTA COUNTY, CALIFORNIA

Memorandum report
Prepared at request of National Park Service

Not reviewed for conformance
with stratigraphic nomenclature
and editorial standards of the
Geological Survey

Sacramento, California
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PROPOSED WELL SITES AT WHISKEYTOWN RESERVOIR, SHASTA COUNTY, CALIFORNIA

By R. H. Dale

INTRODUCTION

The Whiskeytown Reservoir area, about 10 miles west of Redding, California, is shown on the French Gulch quadrangle of the Geological Survey at a scale of 1:62,500. At the request of the Park Service the Ground Water Branch investigated five sites in that area where a water supply is needed for recreational development. Fieldwork was conducted by R. H. Dale and Deota Panday on November 13-16, 1962, inclusive. Mr. Sam King of the Park Service was very helpful in personally guiding the Survey personnel to the development sites. The base maps on which the proposed well sites and reconnaissance geology are shown were supplied by the Park Service.

GEOLOGIC FEATURES

The geology of the Whiskeytown Reservoir area is described in U.S. Geological Survey Professional Paper 285 (Kinkel, A. R., Jr., and others, 1956). Consequently, only a brief description of pertinent geologic units with particular reference to their water-bearing character is given here.

Copley Greenstone

The oldest rock exposed in the area is the Copley Greenstone. Where fresh, it is a hard dense rock that yields no water, but where weathered it yields small amounts. Figure 1, a color photograph, shows fresh greenstone, in a roadcut west of a proposed marina in the Whiskey Creek area. Figures 6 and 7 show location and orientation of photographs.

Chemical analysis 41626 (table 1) which is representative of water from the weathered greenstone indicates that it chemically is suitable for domestic and irrigation uses.

Balaklala Rhyolite

Balaklala Rhyolite directly overlies the Copley Greenstone. The rhyolite generally is shattered and water bearing. The contact between the greenstone and the rhyolite is shown clearly in the foregound of figure 2. Springs that occur at the contact are shown on figure 6.

Chemical analysis 41625, which is representative, indicates that the quality of water in the rhyolite generally is good, with the exception of iron. The iron content of 0.56 ppm would discolor plumbing fixtures and clothing laundered in it. Therefore if water from the rhyolite is to be used by permanent residents it probably would be desirable to plan for treatment of the water to remove the iron. This can be done simply by aeration immediately after pumping from the ground and prior to storage in a reservoir.

Red Bluff Formation

The Red Bluff Formation consists of sand and gravel of Pleistocene age that yields water. This unit, shown by color photographs (figs. 2 and 3) is reddish brown in color. Springs which seep from the contact between the greenstone and the Red Bluff Formation are shown on figure 6. No analysis of water is available from the Red Bluff Formation. However no iron precipitate was observed at the springs, and on the basis of the other analyses in the area it is not likely that the dissolved solids will exceed 250 ppm.

Alluvium

Alluvium of Recent age fills many of the valleys in the Whiskeytown area. One of the better exposures in the Brandy Creek area is shown in the foreground of figure 4. Here the alluvium directly overlies the Copley Greenstone. The alluvium is very permeable and should yield water freely. The quality of water in these deposits are a function of the streams which recharge these deposits. No chemical analyses of water are available. However the quality probably would be suitable for domestic and irrigation uses.

PROPOSED WELL SITES

Oak Bottom

A well at the ranger station appears feasible within the area indicated on figure 5. In that area a well would start in weathered greenstone and should be drilled to unweathered greenstone which probably would occur at a depth of about 100 feet. A small amount of water should be available at the contact between the weathered and unweathered greenstone. However the required minimum of 30 gpm probably will not be available until the reservoir is filled and the permeable weathered greenstone is saturated by recharge from the reservoir.

Whiskey Creek, West Side

The only area favorable for test-well drilling on the west side of Whiskey Creek is in the picnic area (fig. 6). In this area where the Red Bluff Formation caps the impermeable unweathered Copley Greenstone, springs occur at the contact indicating that the Red Bluff Formation is permeable. Because the Red Bluff Formation is not saturated completely it will yield only a small amount of water. However it should yield larger amounts when the reservoir is filled and the material is saturated by recharge from the reservoir. A well in this area should be drilled to a depth of about 50 feet.

Whiskey Creek, East Side

Rhyolite about 50 feet thick forms a cap on the ridge east of Whiskey Creek as outlined on figure 6 (also, see fig. 2). Springs occur at the contact of the underlying greenstone indicating that the rhyolite is permeable and partly saturated. A well in this area should be from 50 to 100 feet deep. The water may require some treatment because of excessive iron, however the springs examined (fig. 6) did not show an excessive precipitate of iron.

Brandy Creek

Permeable alluvium fills the valley of Brandy Creek (figs. 4 and 7). A favorable area for test drilling is indicated on figure 7. A well in the alluvium should be about 50 feet deep. Chemical analysis 41624 indicates that the quality of water is expected to be satisfactory for domestic and irrigation uses.

Headquarters

The existing well at headquarters will not be inundated by the lake, and it is suggested that this well be used. However, because it is completed in the rhyolite it contains considerable iron and may require treatment to precipitate and filter the iron before use.

WATER QUALITY

With the exception of the iron (analysis 41625) in the Balaklala Rhyolite, the expected chemical quality of water in the Whiskeytown Reservoir area will be within the limits established by the U.S. Public Health Service.

Chemical analyses of three samples listed below are given in table 1.

Analysis 41624.--From Brandy Creek in NW¼SW¼ sec. 20, T. 32 N., R. 6 W., MDB&M.

Analysis 41625.--From well 32/6-22Q1 in SW¼SE¼ sec. 22, T. 32 N., R. 6 W., MDB&M.

Analysis 41626.--From spring in NW¼NW¼ sec. 12, T. 32 N., R. 7 W., MDB&M.

Table 1.--Chemical analyses of water

Well number	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)
				Number above line, Number below line,					
Brandy Creek 32/6-20M	11-15-62	20	0.03	6.4 / 0.32	1.5 / 0.12	3.8 / 0.17	0.5 / 0.01	29 / 0.48	0 / 0.00
USBR well 32/6-22Q1	11-15-62	36	0.56	12 / .60	4.9 / .40	10.0 / .44	.0 / .00	69 / 1.13	0 / .00
Greenstone spring 32/7-12D	11-15-62	29	.05	36 / 1.80	15 / 1.24	10 / .44	.0 / .00	195 / 3.20	0 / .00

Parts per million / Equivalents per million: ppm / epm — Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Calculated (Sum of determined constituents)	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Laboratory and laboratory number
1.0 / .02	4.0 / 0.11	0.2 / 0.01	0.6 / 0.01	0.0	52	22	0	27	55	7.1	41624
10 / .21	2.2 / .06	.3 / .02	1.2 / .02	.0	111	50	0	31	133	6.6	41625
4.0 / .08	4.0 / .11	.3 / .02	.7 / .01	.0	195	152	0	13	295	7.5	41626

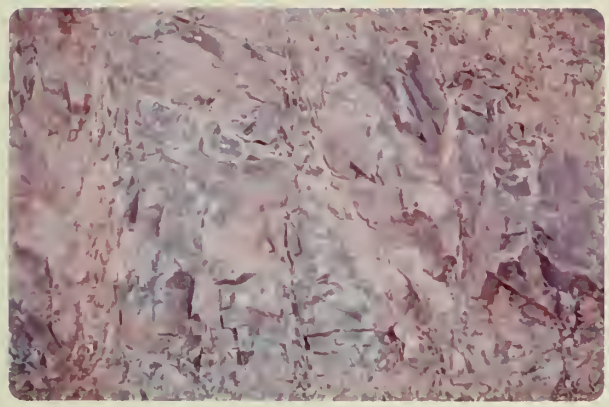

Figure 1. Copley Greenstone.

Figure 2. Copley Greenstone (foreground Balaklala Rhyolite (low unwooded rise middle foreground), Red Bluff Formati (reddish material in center right).

Figure 3. Red Bluff Formation (reddish-brown outcrops).

Figure 4. Alluvium (boulders in central part of photograph), greenstone (in roadcuts).

FIGURE 5